REMARKS

Claims 4-5, 7-14 and 39-50 are in the application.

Claims 40 and 44 have been amended to recited a firing temperature in the range 800-1200 degrees C. This amendment is fully supported by the application as filed, and in particular at page 6, lines 9-11, and present no new matter.

Applicants gratefully note that (1) the rejection of claims 4, 5, 7, 8, 13, 14 and 39 - 43 under 35 U.S.C. § 103(a) as being unpatentable over Balcar et al (U.S. Patent 5,022,897) in view of Joedicke/Skadulis/McMahon has been withdrawn since the Examiner agrees that particles of Balcar et al are not porous, and (2) the rejection of claims 9-12, 44-45 under 35 U.S.C. § 103(a) as being unpatentable over Balcar et al in view of Joedicke/Skadulis, further in view of Ryan et al (US 6,306,795) has been withdrawn since the Examiner agrees that particles of Balcar et al are not porous.

Claims 40, 9-12 and 44-45 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with enablement requirement, because the specification, while being enabling for a firing temperature in the range 800-1200 degrees C, does not provide enablement for the limitation "at least 800 ° C."

Applicants respectfully traverse this rejection as applicable to the amended claims, and request reconsideration and withdrawal of the rejection for this reason.

The limitation "at least 800 ° C" is expressly supported by the application as filed, at page 6, lines 9-11. Nevertheless, in the interest of advancing the prosecution of this long-delayed case, and reserving the right to claim this subject matter in a continuing application, claims 40 and 44 have been amended to recite a firing temperature in the range 800-1200 degrees C, as noted by the Examiner to be enabled by the specification.

Claims 4-5, 7-8, 13, 14, 39, and 40-45 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Joedicke/Skadulis/McMahon in view of Ine et al., further in view of U.S. Patent 5,022,897 ("Balcar et al.").

This rejection is respectfully traversed, and reconsideration and withdrawal of the rejection are respectfully requested as applicable to the amended claims, in view the present arguments and submissions.

The Examiner states that Joedicke/Skadulis/McMahon are applied here for the same reasons as set forth in paragraph 6 of the Office Action mailed on August 10, 2005. The Examiner explains that each of Joedicke, Skadulis and McMahon teaches that the base particles are obtained by crushing and screening mineral aggregates (referencing Joedicke, column 2, lines 46-47; Skadulis, column 1, lines 61-62; McMahon, column 3, lines 3-4). The Examiner acknowledges that Joedicke/Skadulis/McMahon fails to teach that a stone dust produced after crushing and screening is reused by granulating a mixture containing the stone dust and a binder and insolubilizing the binder (Claim 39); the mixture is formed into base particles by a forming process selected from press molding, cast molding, injection molding, extrusion, spray granulation, gel casting, pelletizing, compaction and agglomeration (Claim 4, 15).

The Examiner notes that Ine et al. teach that a stone fine powder after crushing and screening can be recycled to produce granules of desired grain size by mixing the stone powder with a lime stabilizer (a binder) and granulating the mixture by compaction and agglomeration (referencing ¶¶ [0008], [0012]-[0018] of the machine translation and the abstract).

The Examiner concludes that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have recycled a stone fine powder produced after crushing and screening in Joedicke/Skadulis/McMahon for preparing

granules of desirable grain size from by mixing it with a binder and granulating the mixture by compaction and agglomeration, as taught by Ine et al.

The Examiner further acknowledges that Ine et al fails to teach that aluminosilicate containing binder is used as a binder and the binder is insolubilized (Claim 39) by firing the granulated mineral dust in a kiln at a temperature of at least 800°C (Claims 40, 44).

The Examiner further states that Balcar et al teach that a sodium silicate (claimed binder) (referencing column 7, lines 23-27) or a similar substance (claimed binder) (referencing column 5, lines 51-52) in a liquid form (referencing column 6, lines 4-7; column 8, lines 24-26) in an amount of 10 wt % (referencing column 7, lines 23-24) can be used as a binder for granulating a glass dust (referencing column 8, line 26) for the use in roofing granules (referencing column 6, line 16). The Examiner further states that the dust is mixed with the binder on a roller mill (claimed compaction and agglomeration) followed by heating the granulated mixture to 1200 °C to achieve fusion (referencing column 7, lines 33-36).

The Examiner further concludes that since Balcar et al. teach that a sodium silicate or a similar substance can be used a binder (referencing column 5, lines 51-52), obviously a combination of a sodium silicate and a similar substance useful for the same purpose can be used a binder. The Examiner acknowledges that Balcar et al. fail to teach that the similar substance is aluminosilicate. The Examiner contents that Joedicke/Skadulis/McMahon teaches that kaolin (aluminosilicate) can be used together with sodium silicate as a binder to bind to mineral granules, and the binder is insolubilized by firing to form hard roofing granules.

The Examiner states that it has been held that the selection of a known material based on its suitability for its intended use supported a *prima face* obviousness

determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945), citing MPEP 2144.07.

The Examiner ultimately concludes that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used sodium silicate together with kaolin (aluminosilicate) as a binder for granulating a mineral dust in Joedicke/Skadulis/McMahon in view of Ine et al., and insolubilized the granulated mixture by firing, since Balcar et al teach that sodium silicate or a substance similar to sodium silicate can be used as a binder for granulating glass dust for roofing granules and Joedicke/Skadulis/McMahon teaches that sodium silicate together with kaolin (aluminosilicate) can be used as binder in roofing granules that can be insolubilized by firing.

The Examiner further states that it has been held that it is not inventive to discover the optimum or workable ranges of result-effective variables by routine experimentation, citing In re Antonie, 559 F.2d 618, 195 USPQ 6 (CCPA 1977), and In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

The Examiner further concludes that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have determined the optimum values of the relevant temperature parameters for insolubilizing the binder (including those of claimed invention) in cited prior art through routine experimentation in the absence of showing of criticality.

The Examiner further states that it is her position that a kiln is conventionally used for heating to temperatures of 1200°C, and that the prepared roofing granules have porosity within the claimed range because they are prepared by a process substantially identical to that of claimed invention.

The Examiner's conclusions are not correct. The cited group of references does not make out a *prima facie* case of obviousness with respect to rejected claims.

One of ordinary skill in the art would not combine Joedicke/Skadulis/McMahon with Ine et al. as suggested by the Examiner, because the disclosures relate to different arts and have different purposes.

Ine et al. relates to preparing a "hydraulic compound subgrade material" (¶ [003]) a construction material used in road construction. Typically, lime is used to stabilize clayey soils underlying the upper courses of such roads. However, lime-stabilized stone crushed courses can also be used. There is nothing in Ine et al. that would motivate one of ordinary skill in the art to use the lime-stabilized "crushed stone impalpable powder" as a base particle for roofing granules. It is apparent from the operation of Ine et al.'s claimed device that the "stabilized" material has very little if any mechanical strength. This is shown by the facts that large agglomerates ("massive objects") that fall out of the mixer 3 can simply be struck between the vibration screen 4 and the flexible rubber plate 24 to deagglomerate them (¶ [0020]). Further, there is nothing in Ine et al. that would suggest that a different binder be used, or that the resulting "crushed stone impalpable powder" be further treated to provide greater mechanical strength, since the material is intended to be use in road construction, where the object is for the roadbed itself to be stabilized or strengthened, and not the individual constituents thereof.

The Examiner further contends that Balcar et al. teach that sodium silicate or a "similar substance" can be used as a binder for granulating glass dust for roofing granules and that because Joedicke/Skadulis/McMahon disclose kaolin can be used together with sodium silicate as a binder for mineral particles for use in making roofing granule by firing, kaolin/sodium silicate is "similar" to sodium silicate because the intended use of the two is the same, that is, to make roofing granules. However,

applicants respectfully contend that while the intended ultimate intended "use" may the same (roofing granules), the intended proximate intended uses differ, because of the nature of the agglomerate in either case. Balcar et al. fires their glass dust agglomerates at a high enough temperature to fuse the glass dust so as to encapsulate the toxic materials in glass. As the Examiner acknowledges, the resulting material is not porous. The sodium silicate is not a "binder" for the fused glass particles in the same sense that that the reaction product of the silicate/ clay binder is in the case of the agglomerated mineral cores of the algae-resistant granules of the present invention, where the mineral particles retain their own identities and do not fuse during cure of the binder. Thus, in the case of Balcar et al., the intended use is to form "green" agglomerates of glass dust using a binder, which binder is lost or cannot be separately identified after firing of the green agglomerates. In the case of Joedicke/Skadulis/McMahon, the intended use is to form a coating on a mineral particle base, the coating including a binder formed from sodium silicate and clay, and to cure the coating by firing the "green" roofing granules, such that the coating and the mineral particle each retain their identities after cure. The intended use is not the same. The binder used in Joedicke/Skadulis/McMahon is not "similar" to the sodium silicate binder used by Balcar et al.

Reconsideration and withdrawal of the rejection entered under 35 U.S.C. 103(a) over Joedicke/Skadulis/McMahon in view of Ine et al. and further in view of Balcar et al. are respectfully requested as applicable to the amended claims.

Claims 9-12 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Joedicke/Skadulis/McMahon in view of Ine et al., further in view of Balcar et al, and further in view of U.S. Patent 6,306,795 ("Ryan et al.").

This rejection is also respectfully traversed, and reconsideration and withdrawal of the rejection are respectfully requested as applicable to the amended claims.

The Examiner states that Joedicke/Skadulis/McMahon in view of Ine et al., further in view of Balcar et al. are applied here for the same reasons as in the above rejection. Joedicke/Skadulis/McMahon in view of Ine et al., further in view of Balcar et al. fails to teach that an algaecide-forming compound is dissolved in a fluid to form a solution, the solution being drawn into the pores in the base particles by capillary action to form solution-laden particles, the solution-laden particles being subsequently treated to convert the algaecide-forming compound to an inorganic algaecide (Claims 9, 11, 12, 44); the algaecide-forming compound is a soluble copper salt (Claim 10).

The Examiner states that Ryan et al. teach that cuprous oxide can be incorporated into a porous carrier material such as silica/alumina (See column 10, lines 27-28) by impregnating the porous carrier material with an aqueous solution of copper salts such as copper nitrate using e.g. well known the pore-volume impregnation (PVI) method (See column 11, lines 4-7, 22-42, 50-67), air drying and calcining the impregnated porous carrier material at 200 °C-540 °C to convert the copper salt to cupric oxide, cuprous oxide, or a mixture of the two (See column 12, lines 1-22),

The Examiner concludes that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added copper salts such as copper nitrate in an aqueous coating composition of cited prior art instead of Cu_2O (claimed slurry) before firing at 700°F (371°C) with the expectation of providing the desired intimate mixture of copper oxides with the porous carrier material since Ryan et al teach that cuprous oxide can be incorporated into a porous carrier material such as silica/alumina by impregnating the porous carrier material with an aqueous solution of copper salts such as copper nitrate using e.g. well known the pore-volume impregnation

(PVI) method, air drying and calcining the impregnated porous carrier material at 200 °C-540 °C to convert the copper salt to cupric oxide, cuprous oxide, or a mixture of the two.

The Examiner's conclusion is not correct.

As previously noted above, Ine et al. is not properly combinable with Joedicke/Skadulis/McMahon because they relate to non-analogous arts. Similarly, Balcar et al.'s binder is not intended for a purpose similar to that of the Joedicke/Skadulis/McMahon binder.

Ryan et al. disclose stable highly active supported copper based catalysts, an art that is not analogous to the roofing granule art. Ryan et al. is interested in retaining the copper in the carrier, while the present invention is directed to algae-resistant roofing granules, which permit the metal species to slowly leach out of the roofing granule. Ryan et al. deposits copper on a specially prepared, mechanically stable phase of aluminum oxide to form a catalyst, and this catalyst contains massive amounts of copper metal (up to 35 percent) in comparison with the amount of copper in the roofing granules of the present invention. Ryan et al. employ highly calcined aluminum oxide as a support for the catalyst.

Further, there is nothing in Ryan et al. that alone or in combination with any one or more of the other cited references that would teach or disclose applicants' presently claimed invention to one of ordinary skill in the art. The cited references do not make out a *prima facie* case of obviousness, but are simply a hindsight attempt to reconstruct applicants' presently claimed invention using a large number of references (4).

Applicants respectfully request that the present rejection be withdrawn for these reasons.

Claims 46-50 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Joedicke/Skadulis/McMahon in view of Ine et al., further in view of Ryan et al., and further in view of U.S. Patent 4,735,975 ("Iwata et al.").

This rejection is respectfully traversed, and reconsideration and withdrawal of the rejection are respectfully requested as applicable to the amended claims.

The Examiner states that Joedicke/Skadulis/McMahon in view of Ine et al. in view of Ryan et al. are applied here for the same reasons as recited in the previous rejections.

The Examiner states that obviously, the amount of algaecide deposited in roofing granules of pelletized stone dust by a method of Ryan et al. would depend on porosity of the granules, i.e. an amount of algaecide deposited in roofing granules of pelletized stone dust can be controlled by controlling porosity of pelletized stone dust.

The Examiner acknowledges that the cited prior art does not teach that porosity can be controlled by selection of the shape of the stone dust (Claims 46, 48) or by selection of the particle size distribution (Claims 47, 49) or by adjusting the ratio of stone dust and aluminosilicate (Claim 50).

The Examiner further notes that Iwata et al. teach that distribution and porosity of granulated powder material (See column 2, lines 43-43) may be controlled by particle size distribution of the granular material, shape of the granules and/or the amount of the binder resin (referencing column 3, lines 12-18).

The Examiner concludes that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have controlled porosity of pelletized stone dust in Joedicke/Skadulis/McMahon in view of Ine et al. by particle size distribution of the granular material, shape of the granules and/or the amount of the binder resin, as taught by Iwata et al.

Applicants respectfully contend that Iwata et al. relates to a non-analogous art and is not properly combinable with the other references cited. Iwata et al. relates to the preparation of a friction material for automotive brake pads formed from a fibrous material, a granular material and a thermoset resin. The amount of binder resin is deliberately reduced to less than that required to fill all the interstices between the fibers and granular materials (col. 2, lines 58-63).

Applicant also respectfully note that the Examiner has not cited Balcar et al. in making this rejection, perhaps through an oversight, since in the absence of Balcar et al., the cited combination of references do not even arguably make a *prima facie* case of obviousness. Consequently, for the purpose of this response, applicants will assume that the cited combination also includes Balcar et al.

As noted above, Ine et al. is not properly combinable with Joedicke/Skadulis/McMahon because they relate to non-analogous arts. Similarly, Balcar et al.'s binder is not intended for a purpose similar to that of the Joedicke/Skadulis/McMahon binder. Iwata et al. does nothing to remedy these deficiencies, as it relates to yet another art. Applicants respectfully contend that the citation of a multitude of references (five in this instance, assuming the intention to cite Balcar et al.) from a variety of different, non-analogous arts, signifies a hind-sight driven reconstruction of applicants' presently claimed invention.

Reconsideration and withdrawal of the rejection entered over Joedicke/Skadulis/McMahon , Ine et al., Balcar et al. (assumed), Ryan et al. and Iwata et al. are respectfully requested for these reasons as applicable to the amended claims.

Applicants respectfully solicit reconsideration, withdrawal of the rejections entered, and an early notice of allowance.